

PATENT ABSTRACTS OF JAPAN

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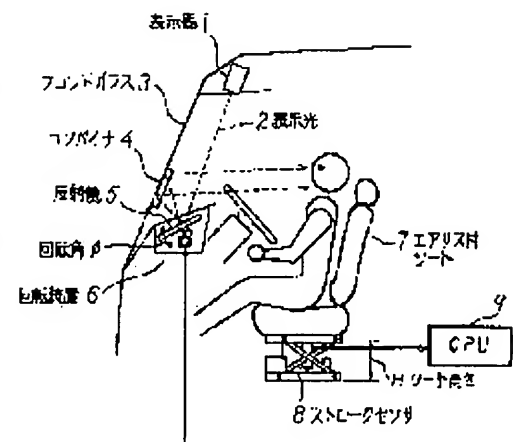
(54) DISPLAY DEVICE FOR VEHICLE

(57)Abstract:

PURPOSE: To force a display device to cope with the movement of driver's line of sight during running of a vehicle by providing a means for rotating a reflecting means which reflects display light toward the position of driver's line of sight wind shield and making control in such a way that rotation angle comes to the optimum position of driver's line of sight based on a difference between the height of seat detected by a height detection means and the reference height of the reflecting means.

CONSTITUTION: A control means 9 computes a difference between the height H of a driver seat 7 detected by a height detection means 8 of the driver seat 7 and the reference height.

The reference height means the height of seat which corresponds to the position of driver's line of sight when a reflecting means 5 which reflects display light 2 from a display means 1 comes to the reference position. A rotation means 6 is rotated by this difference, that is, rotation angle which is proportional to up and down strokes, and display light 2 which is reflected by rotating the reflecting means 5 is projected on a windshield 3 not only when a vehicle is stationary but also when it runs in correspondence to up and down strokes of the driver seat and is kept at the optimum position of driver's line of sight.



LEGAL STATUS

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the block diagram of the example of the display for cars concerning this invention.

[Drawing 2] It is the transverse plane and side elevation having shown the example of the device part which combined the reflecting mirror and slewing gear of the display for cars concerning this invention.

[Drawing 3] It is drawing having shown roughly the example of the installation device part to the driver's seat of the stroke sensor used for the indicating equipment for cars concerning this invention.

[Drawing 4] It is the fragmentary sectional view showing the example of the stroke sensor used for the display for cars concerning this invention.

[Drawing 5] It is the flow chart Fig. of the program performed in CPU of the indicating equipment for cars concerning this invention.

[Drawing 6] It is a graphical representation for explaining the relation of the angle of rotation of a reflecting mirror and the sheet vertical stroke of a driver's seat in the indicating equipment for cars concerning this invention.

[Description of Notations]

- 1 Drop
- 2 Display Light
- 3 Windshield
- 4 Combiner
- 5 Reflecting Mirror
- 6 Slewing Gear
- 7 Driver's Seat
- 8 Stroke Sensor
- 9 CPU

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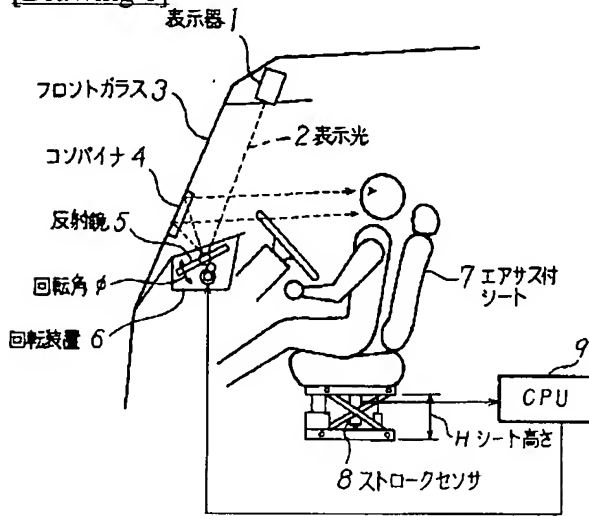
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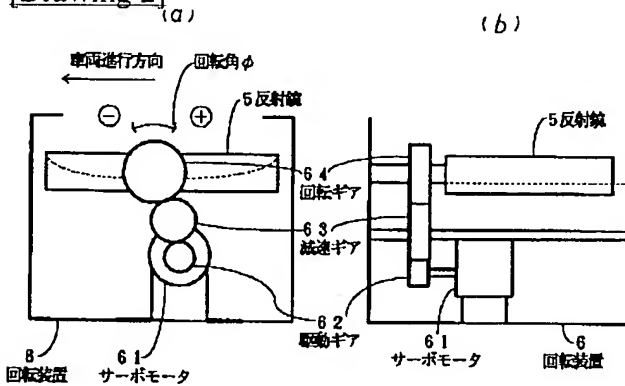
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DRAWINGS

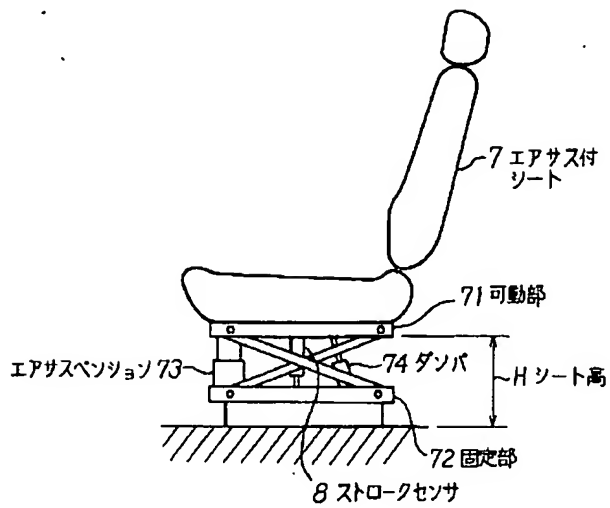
[Drawing 1]



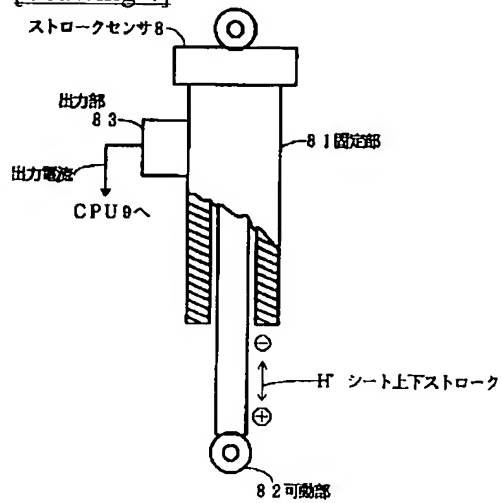
[Drawing 2]



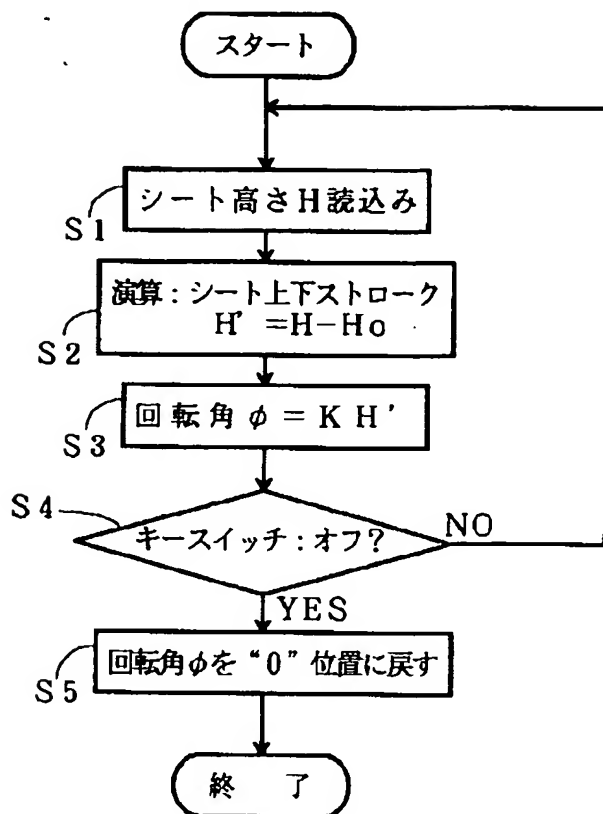
[Drawing 3]



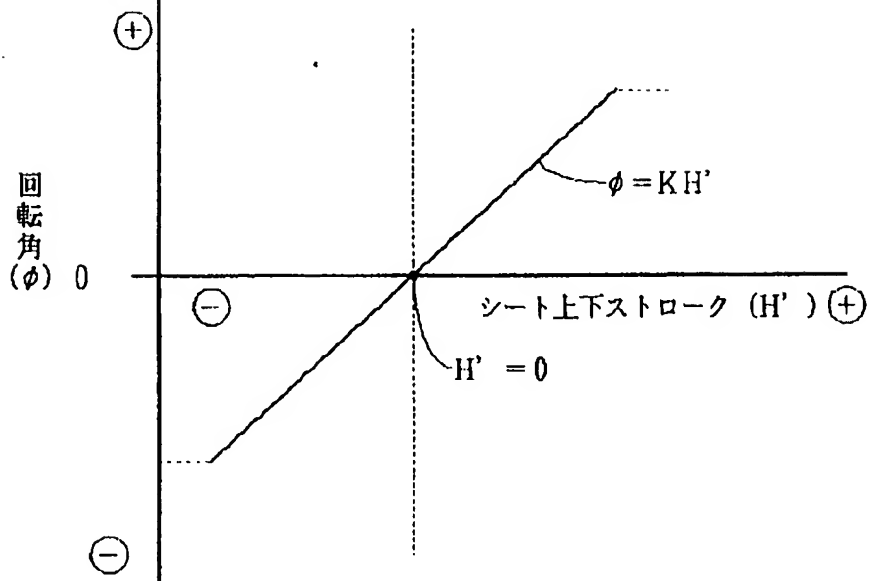
[Drawing 4]



[Drawing 5]



[Drawing 6]



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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] Especially this invention relates to the indicating equipment for cars with which a driver is called the so-called HUD (HUD) which checks the virtual image by looking ahead of a windshield by projecting the display light from a display means on the windshield of a car, and making it reflect towards the look location of a driver about the indicating equipment for cars.

[0002]

[Description of the Prior Art] As a display for cars known as such a HUD There are some which were conventionally indicated by JP,63-258233,A and it sets to this equipment. Prepare the first mirror which reflects the display light from projection equipment in vehicle room head lining, and the second mirror which reflects the reflected light from this first mirror toward a windshield is installed on a dashboard. He was trying to make a driver check by looking the virtual image of the display light which is made to reflect the reflected light from the second mirror in a drivers side by the windshield, and is produced ahead [windshield].

[0003] However, with the equipment indicated by above-mentioned JP,63-258233,A, since the reflective location to the windshield of display light is fixed, there is fault that it cannot respond to it even if it changes the height of the eye of a driver, and there are some which were indicated by JP,62-66822,U as a conventional example which has solved this fault.

[0004] In this equipment, the reflecting mirror in which rotation adjustment is free is prepared between a display means and a windshield. Since he is trying to double the reflective projection location to the windshield of display light with the look location of a driver in case a driver (car) is a quiescent state by adjusting the include angle of this reflecting mirror Even if the look location of a driver changed for the reasons of a driver replacing, it had prevented that the projection location to the windshield of display light shifted from this look location.

[0005]

[Problem(s) to be Solved by the Invention] however, with the equipment indicated by above-mentioned JP,62-66822,U Since it is only controlling to double the projection location to the windshield of display light with the look location of a driver in case a driver (car) is a quiescent state If this equipment is used for a medium size, a large-size car, etc. equipped with the driver's seat with an air suspension with the big vertical movement magnitude under transit (it is hereafter called a sheet with an air sus for short) It could not respond to the magnitude of look migration of the driver accompanying the big vertical movement magnitude of the sheet with an air sus under transit, but there was a trouble said that a display image will separate from the look of a driver.

[0006] Then, this invention aims at offering the display for cars which can respond not only to the time of quiescence of a car but to look migration of the driver under transit.

[0007]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the display for cars concerning this invention A means to rotate a reflective means to turn the display light from a display means to the look location of the driver of the windshield of a car, and to reflect, The difference of the height detection means of a driver's seat, and this sheet height detected with this height detection means and the criteria height corresponding to the criteria location of this reflective means is calculated. It has the control means which drives this rotation means so that angle of rotation of this rotation means may serve as optimal look location to a driver in proportion to this difference.

[0008]

[Function] In the indicating equipment for cars concerning this invention, a control means first reads the driver's seat height (namely, driver's seat height set up in order to obtain the operation position of liking [a driver]) detected with the height detection means of a driver's seat.

[0009] And the difference of this sheet height and criteria height that were detected is calculated. It is the sheet height corresponding to the look location of a driver in case a reflective means to reflect the display light from a display means as the criteria height in this case is in a criteria location.

[0010] Thus, the difference (namely, vertical stroke of a driver's seat) of the sheet height and criteria height which were obtained is detected, and only angle of rotation proportional to this vertical stroke rotates a rotation means. Therefore, by rotating a reflective means with this rotation means, the display light reflected with this reflective means will be projected on a windshield during transit corresponding to the vertical stroke of not only the time of quiescence of a car but a driver's seat, and will be held in the optimal look location of a driver.

[0011]

[Example] Drawing 1 is drawing to show the outline of the configuration of the example of the indicating equipment for cars concerning this invention, and shows the cross section of a driver's seat. The drop as a means by which 1 displays various information (display pattern), such as the vehicle speed and time amount, in this drawing, The combiner as the projection section of the display light 2 with which the display light from a drop 1 and 3 were prepared in the windshield, and 2 prepared 4 in the inside of a windshield 3, The reflecting mirror which used the concave mirror as one example of a reflective means by which 5 projects the display light 2 on a combiner 4, The slewing gear as a rotation means by which 6 rotates a reflecting mirror 5, and 7 The sheet with an air sus as a driver's seat, It is CPU (Central Processing Unit) as a control means which 8 reads the stroke sensor as a height detection means of the sheet 7 with an air sus, and 9 reads the output of the stroke sensor 8, and sends out a driving signal to a slewing gear 6.

[0012] Next, drawing 2 (a) And (b) It is the front view and side elevation having shown roughly the example of the combination device part of the reflecting mirror 5 and slewing gear 6 which are used for the display for cars concerning this invention, respectively. The servo motor which 61 rotate with the signal from CPU9 among drawing, the drive gear which prepared 62 on the shaft of a servo motor 61, 63 is a moderation gear which slows down the rotation of a servo motor 61 which it was installed so that it might gear with the rotation gear 64 which fixed to the drive gear 62 and the reflecting mirror 5, and was prepared, and was received through the drive gear 62, and tells a reflecting mirror 5 through the rotation gear 64. In addition, in this example, the direction which rotates the direction which rotates the angle of rotation ϕ of a reflecting mirror 5 ahead to the travelling direction of a car to minus and back is set up with plus like illustration.

[0013] Furthermore, drawing 3 is the side elevation having shown roughly the example of the installation condition to the sheet 7 with an air sus of the stroke sensor 8 used for the display for cars concerning this invention, and 71 is a damper for the fixed part of the sheet 7 with an air sus and 73 to prevent an air suspension, and for 74 prevent rapid vertical movement of the sheet 7 with an air sus, as for the moving part of the sheet 7 with an air sus, and 72. In addition, in this example, like illustration, the both ends connect with moving part 71 and a fixed part 72, respectively, and form the stroke sensor 8, and it installs so that sheet height H may be detected.

[0014] Furthermore, drawing 4 is the fragmentary sectional view having shown roughly the configuration of the example of the stroke sensor 8 shown in drawing 1 and 3, and the fixed part by which 81 is connected to the moving part 71 (or fixed part 72) of drawing 3, the moving part by which 82 is connected to the fixed part 72 (or moving part 71) of drawing 3, and 83 are the output sections.

[0015] In this configuration, if moving part 82 is pulled out to a fixed part 81 or is pushed in, the current value generated in a fixed part 81 will change, and this current value that changed is sent out to CPU9 through the output section 83 as a signal which shows height H of the sheet 7 with an air sus. In addition, not only the configuration that was constituted as a stroke sensor 8 so that it might carry out movable, respectively and that is shown in drawing 4 if [one] change of the mutual location of the components to construct or spacing can be outputted as a current value change but the thing of any configurations can be used.

[0016] Moreover, drawing 5 is the flow chart Fig. of the program memorized and performed by CPU9 shown in drawing 1, and explains hereafter actuation of the example shown in drawing 1 R> 1 - drawing 4 with reference to the related graph of the sheet vertical stroke H' and the angle of rotation ϕ which were shown in drawing 6 based on this drawing.

[0017] If this program starts, CPU9 will read the sheet quantity H after manual actuation of the sheet 7 with an

air sus shown in drawing 1 and drawing 3 from the output of the stroke sensor 8 (step S1 of drawing 5).

[0018] And sheet vertical stroke H' (stroke difference $H'=H-H_0$) which is that difference about this sheet height H as compared with the criteria height H_0 is computed (this step S2).

[0019] When the criteria height H_0 in this case was explained, for example a reflecting mirror 5 makes the mid-position of the range which carries out movable the criteria location of a reflecting mirror 5. It is what shows the sheet height corresponding to the macro-scopic location of a driver when the display light 2 from an indicator 1 reflects by the reflecting mirror 5 and the combiner 4. From an experiment It has become clear that average sheet height when the driver of the very average seated height is sitting on the driver's seat is the optimal value. At this time, the location of the reflecting mirror 5 which is in agreement with the look of this driver turns into an above criteria location. Therefore, in the initial state when throwing in a key switch (not shown), the reflecting mirror 5 in step S1 needs to be in a criteria location so that it may mention later.

[0020] And an angle of rotation ϕ is searched for based on sheet vertical stroke H' which carried out in this way and was calculated (step S3).

[0021] Here, it explains from the related graph which shows the process which an angle of rotation ϕ searches for from sheet vertical stroke H' to drawing 6. In addition, in this example, when a location descends to the plus direction (right-handed rotation of illustration) which shows the hand of cut of a reflecting mirror 5 to drawing 2 when the location of the sheet 7 with an air sus rises on the contrary, it is set as it with the minus direction (left-handed rotation of illustration) of drawing 2.

[0022] It is checked from the experiment that the include angle ϕ which a reflecting mirror 5 rotates from an above criteria location is proportional to sheet vertical stroke H' , and about 90 percent of the driver usual in this corresponds. Therefore, by plotting and going to a graph as shows the angle of rotation ϕ corresponding to various sheet vertical stroke H' to drawing 6, that proportionality constant K is called for, and if sheet vertical stroke H' is multiplied by this proportionality constant, an angle of rotation ϕ will be acquired.

[0023] Thus, when CPU9 rotates a slewing gear 6, a reflecting mirror 5 will also rotate [only an angle of rotation ϕ] only the angle of rotation ϕ computed by relational-expression $\phi=KH'$ containing a proportionality coefficient K . Then, although CPU9 repeats steps S1-S3 as a key switch (not shown) confirming whether to be an OFF state (this step S4), and judging with an ON state, if it judges with an OFF state, a slewing gear 6 will be driven so that the location of a reflecting mirror 5 may be returned to a criteria location (step S5). This is because criteria will be lost in the amount of drives of a slewing gear 6 when step S1 is performed the next processing period of drawing 5 if a reflecting mirror 5 is not returned to a criteria location.

[0024]

[Effect of the Invention] As explained above, in the display for cars concerning this invention Since it constituted so that angle of rotation of a rotation means to rotate this reflective means in proportion to the difference of the detected driver's seat height and the criteria height corresponding to the criteria location of a reflective means to reflect the display light from a display means might serve as optimal look location to a driver The display image from a display means can be set by the look location of a driver also not only during the time of quiescence of a car but during transit.

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CLAIMS

[Claim(s)]

[Claim 1] A means to rotate a reflective means to turn the display light from a display means to the look location of the driver of the windshield of a car, and to reflect, The difference of the height detection means of a driver's seat, and this sheet height detected with this height detection means and the criteria height corresponding to the criteria location of this reflective means is calculated. The display for cars characterized by having the control means which drives this rotation means so that angle of rotation of this rotation means may serve as optimal look location to a driver in proportion to this difference.

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